

Seafood Watch

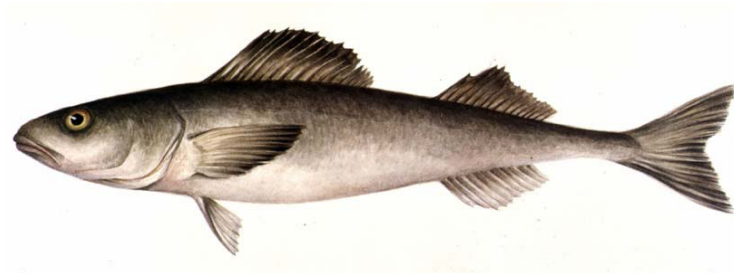
Seafood Report



MONTEREY BAY AQUARIUM*

Sablefish

Anoplopoma fimbria



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British Columbia

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Stock status updated: March 17, 2011

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About SeaChoice, Seafood Watch® and the Seafood Reports

This report is a joint product of SeaChoice and the Monterey Bay Aquarium Seafood Watch® program. Both organizations evaluate the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. In doing so, SeaChoice applies the definition of sustainable seafood and the method for its evaluation and presentation developed by the Seafood Watch program at the Monterey Bay Aquarium. Seafood Watch defines sustainable seafood as originating from species, whether wild-caught or farmed that can maintain or increase production into the long-term without jeopardizing the structure or function of affected ecosystems.

SeaChoice is a comprehensive seafood markets program with the primary goal of realizing sustainable fisheries in Canada and abroad. **SeaChoice** uses the best available science, strategic communications and partnerships to mobilize sustainable seafood markets via six main programs: (1) research, (2) industry outreach, (3) public education, (4) retail partnerships, (5) strategic communications, and (6) dialogue with government. More information on **SeaChoice** can be obtained at www.SeaChoice.org

Seafood Watch makes its science-based recommendations available to the public on our website (www.SeafoodWatch.org), print materials, an iPhone app and other media. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans. Each sustainability recommendation is supported by a Seafood Report. Each report synthesizes and analyzes the most science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices", "Good Alternatives" or "Avoid". The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch's sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

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SeaChoice and Seafood Watch strive to have all seafood reports reviewed for accuracy by external scientists with expertise in ecology, fishery science and aquaculture. Scientific review, however, does not constitute an endorsement on the part of the reviewing scientists of SeaChoice or the SeaChoice program, or the Seafood Watch program or their recommendations. SeaChoice and Seafood Watch are solely responsible for the conclusions reached in this report.

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I. Executive Summary

Despite being very long lived (113 years), sablefish have a low inherent vulnerability to fishing pressure due to fast growth rates and low age of first reproduction.

The largest concern in the British Columbia sablefish fishery at present is the low level of abundance relative to the historical population highs observed in previous decades. Sablefish abundance is considered primarily driven by large-scale environmental conditions that result in the stronger and weaker year classes ultimately in control of the size of the fishery's exploitable biomass. Sablefish stocks are not considered overfished or no overfishing is believed to be occurring; however, both biomass and fishing pressure relative to defined reference points are unknown. Management of the sablefish fishery employs a Management Strategy Evaluation process to set quotas with a high probability of allowing sablefish stocks to rebuild. Overall, uncertainty in stock status and relatively low abundance, combined with precautionary quotas designed to allow the stock to increase, result in a moderate conservation concern for the stock status of sablefish.

Current data indicate that discarded dead bycatch in this fishery amounts to less than 10% of targeted landings and does not regularly include species of special concern. Therefore, bycatch is considered to be of low concern for this assessment, but future access to comprehensive observer data may change this ranking.

The sablefish fishery uses traps and longlines, both of which are stationary gear types that contact the seafloor habitat, resulting in a moderate conservation concern. The deepwater, soft-bottom habitat where sablefish are fished is considered moderately resilient to fishing, resulting in a moderate ranking for habitat impacts in the sablefish fishery.

Management of the sablefish fishery conducts stock assessments regularly using both fisheries-independent and fisheries-dependent data. Management has a history of complying with scientific advice, and there is strong enforcement of regulations, including observer coverage. Although stock productivity has varied over time, management has a track record of rapidly responding to declines in abundance by lowering quotas. Overall, management is considered highly effective.

High inherent resilience to fishing pressure, low bycatch, and effective management, combined with moderate concerns for stock status and impact on the seafloor habitat, result in a recommendation of 'Best Choice' for the British Columbia trap and longline sablefish fishery.

The British Columbia sablefish fishery has been certified as "sustainable" to the Marine Stewardship Council (MSC) standard. The MSC is an independent non-profit organization that has developed an environmental standard for sustainable and well-managed fisheries. It uses a product label to reward environmentally responsible fishery management and practices (<http://www.msc.org/>).

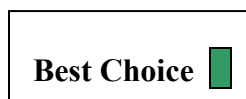
Table of Sustainability Ranks

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherent Vulnerability	✓			
Status of Stocks		✓		
Nature of Bycatch	✓			
Habitat Effects		✓		
Management Effectiveness	✓			

About the Overall Seafood Recommendation:

- A seafood product is ranked **Avoid** if two or more criteria are of High Conservation Concern (red) OR if one or more criteria are of Critical Conservation Concern (black) in the table above.
- A seafood product is ranked **Good Alternative** if the five criteria “average” to yellow (Moderate Conservation Concern) OR if the “Status of Stocks” and “Management Effectiveness” criteria are both of Moderate Conservation Concern.
- A seafood product is ranked **Best Choice** if three or more criteria are of Low Conservation Concern (green) and the remaining criteria are not of High or Critical Conservation Concern.

Overall Seafood Recommendation:



Good Alternative 

Avoid 

II. Introduction¹

Biology

Sablefish (*Anoplopoma fimbria*) can be found throughout the North Pacific, ranging as far west as Japan, north to the Bering Sea and south to central Baja California. Their center of abundance is primarily the Gulf of Alaska extending into northern British Columbia. Sablefish are typically a deepwater species inhabiting shelf and slope waters to depths of 1500 m. Genetically, sablefish are considered a single population throughout their range, but adult movement is typically limited, which allows for assessments at a smaller scale. In the northeast Pacific, sablefish are generally considered as two separate stocks: a northern stock extending from Alaska to northern

¹ Background on fishery and biology from: <http://www.canadiansablefish.com/index.htm> and <http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/groundfish/sablefish/default.htm>

British Columbia and a second southern stock extending from southern British Columbia south to California (Sigler *et al.* 2003).

Spawning occurs from January through March along the continental shelf at depths greater than 1000 m. Larvae then make their way to the surface waters above the shelf and migrate inshore over the following six months. They remain in inshore waters for a period of up to five years before returning to offshore waters and becoming vulnerable to the fishery. As juveniles, sablefish are highly migratory, moving through nursery areas in the North Pacific from Hecate Strait to the Bering Sea. Most sablefish growth occurs in the first five years. The size of the population appears to be heavily influenced by environmental variables that influence the survival rate of larvae and juveniles. At certain times, environmental conditions favor survival, which results in strong year classes that can be followed by several years of poor conditions. Sablefish live up to 113 years, potentially a strategy to ensure their survival through extended periods of unfavorable environmental conditions.

Fishery

Sablefish first appeared in Canadian government reports in the 1880s where they were referred to as skilfish. Later, sablefish became more commonly known as black cod. Although sablefish were captured in small quantities associated with early commercial halibut fisheries, it was not until the late 1960s that directed fisheries for sablefish began in what is now Canada's Exclusive Economic Zone. Distant-fleet Japanese fishers were the first to target sablefish, but by 1977, the adoption of a 200-mile EEZ ended the foreign capture of sablefish. Canadian catch of sablefish was limited to a low-value bycatch in association with other groundfish through much of the 1970s. By the late 1970s and early 1980s, Canadian-caught sablefish were beginning to be marketed in Japan, resulting in increased value and a subsequent increase in the number of boats pursuing this deepwater fish.

In 1981, the Department of Fisheries and Oceans (DFO) took steps to limit the entry of vessels in the sablefish fishery, resulting in 48 vessels receiving a 'K' or sablefish license. Today, there are still only 48 licenses renewed annually by the DFO. The sablefish fishery was initially managed by seasonal openings, which resulted in intensification of both gear and technology as licensees vied for the greatest possible portion of the total allowable catch (TAC) in a derby-style fishery, resulting in a fleet that could effectively catch the entire quota in only 14 days by 1989. In the following year, management changed from a derby-style fishery to an individual transferable quota (ITQ) fishery where each of the 48 licensed vessels was allocated a proportion of the TAC, thereby ending the race for fish. Under an ITQ regime, the allocated catch can either be fished by a given licensee or leased to another vessel. As a result of this transferability, only about 30 licenses are actively fished during most years.

Annual landings since 1990 have typically fallen between 3000 and 5000 t. Sablefish are landed primarily using traps while lesser amounts are taken with longlines and trawl gear (Figure 1). The trawl fleet is allocated 8.75% of the TAC, which is set annually based on a comprehensive stock assessment combining biological, fishery, and research survey data.

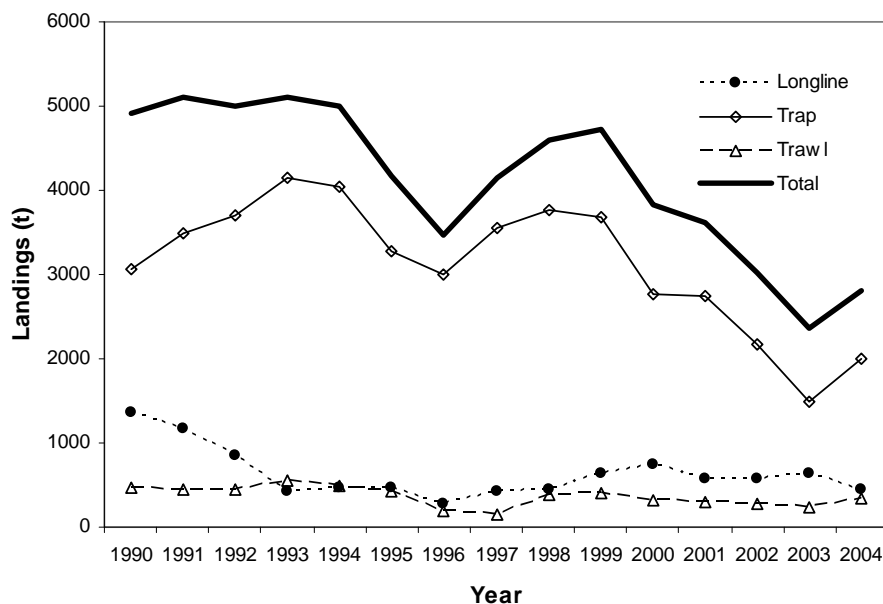


Figure 1. Annual landings of sablefish by British Columbia's commercial fisheries between 1990 and 2004. Source: DFO PacHarv database.

Scope of the analysis and the ensuing recommendation:

The recommendations and analysis in this report are limited to sablefish captured from Canada's Pacific waters. The recommendation applies to sablefish captured using either trap or longline gear, which together represent 85–95% of sablefish landings in Canada's Pacific waters.

Availability of Science

Sablefish are a well-studied species subjected to annual assessments, abundance surveys, tagging studies, and the collection of biological data (i.e., length, sex). Available fisheries data includes logbooks, dockside-monitored catch data, and observer data. The fleet is currently moving toward full electronic monitoring (i.e., video surveillance). For the 2005/06 fishing season, the fleet target for electronically monitored observer coverage was 20% (FOC 2005).

Market Availability

Common and market names:

Although sablefish have historically been referred to by several other names such as skilfish, skil, and coalfish, they are currently marketed in North America as sable, sablefish, or black cod.

Seasonal availability:

Canadian sablefish are available year round.

Product forms:

Sablefish are primarily exported as frozen fillets gutted with the head off. Domestically, they are often sold fresh or smoked.

Import and export sources and statistics:

Approximately 80% of Canadian sablefish are sold to the Japanese and Hong Kong markets. The majority of the remainder is sold in North America.² In 2005, Canada exported 2131 t of sablefish and imported 62 t.³ Sablefish are becoming increasingly available in Canada.

² <http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/groundfish/sablefish/overview.htm> (Visited February 25, 2006)

³ http://www.dfo-mpo.gc.ca/communic/statistics/trade/canadian_trade/export_data/xsps05_e.htm (Visited February 25, 2006)

III. Analysis of Seafood Watch® Sustainability Criteria for Wild-caught Species

Criterion 1: Inherent Vulnerability to Fishing Pressure

Although sablefish are very long-lived, they have a low inherent vulnerability to fishing pressure based on age at first maturity, growth rate, and fecundity. Sablefish can reach maturity as early as two years of age but typically 50% of males reach maturity at 5 years and 50% of females reach maturity at 6.5 years (Sigler *et al.* 2004). The growth rate (von Bertalanffy growth coefficient, k) is a measure of the rate at which asymptotic body length is approached; it is often used as an indicator of species resilience to fishing pressure. For sablefish, k is approximately 0.2, which is in the low range of vulnerability (Froese and Pauly 2005). Sablefish fecundity increases with the size of the fish; female egg production typically ranges between 100,000 and 1,000,000 eggs (Macewicz and Hunter 1994). Sablefish do not exhibit special behaviors such as spawning aggregations that would increase their vulnerability to fishing pressure. The deepwater benthic environment that sablefish inhabit in the Northeastern Pacific is robust enough to support their populations.

Table 1. Life history characteristics of sablefish.

Growth Rate	Max Size	Age at Maturity (Years)	Maximum Age (Years)	Fecundity	Species Range	Sources
K=0.2	114 cm; 25 kg	1 st =2 M _{50%} =5 F _{50%} =6.5	113 yrs	0.1–1 million eggs	North Pacific	FOC 2005 Froese and Pauly 2005 Macewicz and Hunter 1994 Mecklenburg <i>et al.</i> 2002 Sigler <i>et al.</i> 2004

Inherent Vulnerability Rank:

Resilient 	Moderately Vulnerable 	Highly Vulnerable 
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Criterion 2: Status of Wild Stocks

For management purposes, British Columbia's sablefish population is broadly considered as a single unit.

Factor 1: Management classification status

Sablefish are believed to be a fully exploited species. The last available full assessment of the fishery was published in 2005. In the interim, the fishery is being managed using a Management Strategy Evaluation (MSE) approach that uses regular incorporation of new data to update the total allowable catch (TAC) rather than annual full stock assessments (Cox and Kronlund 2009). The conservation objectives of the MSE include maintaining or rebuilding stocks above the 2007 level and above 20% of unfished biomass with 90% certainty (Cox and Kronlund 2009). While the MSE framework allows management to set quotas that are likely to meet these conservation objectives in the future, the strategy has only recently been implemented and does not allow for robust determination of whether stocks are currently overfished. This factor is therefore considered a moderate conservation concern.

Factor 2: Current population abundance relative to B_{MSY}

Current population abundance relative to B_{MSY} is unknown. Reference points based on maximum sustainable yield (MSY) are in the process of being defined and should be available by April 2011. Current management has set a goal of maintaining stock abundance above 20% of unfished biomass with 90% certainty (Cox and Kronlund 2009). As of 2007, four scenarios have been defined for sablefish based on combinations of stock productivity and spawning stock depletion: S1 – low productivity/low depletion; S2 – low productivity/moderate depletion; S3 – high productivity/moderate depletion; and S4 – high productivity/optimal depletion. These four scenarios are all considered plausible and statistical analyses have not shown any one scenario to more closely explain historical data than the others; therefore, all four scenarios were presented. All scenarios except for S1 projected 2007 stock abundance above 20% of the unfished biomass and above 50% of B_{MSY} , while all except for S4 projected stock abundance below B_{MSY} (Cox and Kronlund 2009). As such, while B/B_{MSY} is unknown, it is likely to be moderately below unity. This factor is considered a moderate conservation concern.

Factor 3: Occurrence of overfishing

An overfishing threshold has not been determined for sablefish in Canadian waters, but there is no indication that overfishing is occurring in the sablefish fishery. Under the MSE, TACs are set conservatively to achieve a high probability that stocks will rebuild under precautionary assumptions (i.e., in the low productivity scenarios, S1 and S2).

Factor 4: Overall degree of uncertainty in status of stock

Although there is significant uncertainty associated with understanding the biomass in the Canadian portion of the sablefish range for the purposes of providing precise TACs, the overall stock status is well understood in comparison to most of the world's fisheries. Annual fisheries-independent assessments are conducted throughout the range of this species and include several indicators of stock health. Consistency between US and Canadian assessments suggests that the surveys are able to track abundance. Nevertheless, due to significant uncertainties in the model

and the need for an updated full stock assessment, uncertainty in the stock status is considered moderate.

Factors 5–6: Long-term and short-term trend in abundance

Stock abundance, measured using catch per unit effort (CPUE) as a proxy, is thought to have decreased consistently from the early and mid-1990s to an historic low in 2001 due to poor recruitment; this was followed by a slight increase until 2004 and then another decline over the past few years (Figure 2). According to these estimates, stock abundance is declining in the long-term and fluctuating in the short-term (relative to the generation time of sablefish).

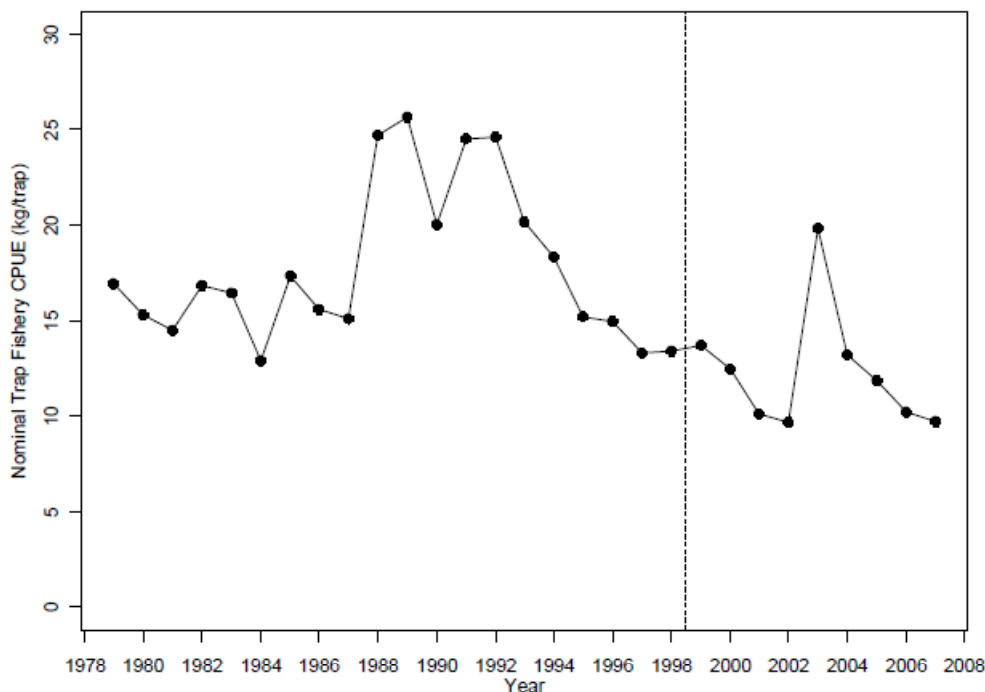


Figure 2. Nominal and GLM-standardized relative indices of retained catch rate in the sablefish fishery. The GLM standardized series has been scaled to the mean of the nominal series for the years of overlap. The vertical dashed line indicates the adoption of escape rings in traps. Source: Cox and Kronlund 2009.

Factor 7: Current age, size, or sex distribution

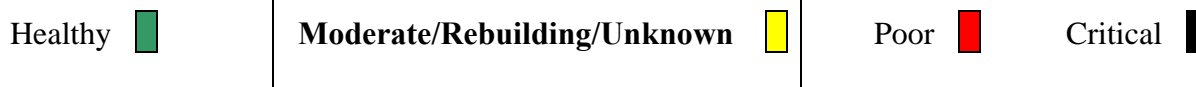
Detailed long-term biological analyses of sablefish captured in British Columbia have not been published. Consequently, there is no information to determine whether the current age, size and sex distributions of sablefish represent a natural condition. This factor is considered a moderate conservation concern.

Synthesis

The status of British Columbia's wild sablefish stocks is considered moderate due to the unknown status of many primary indicators. Current abundance is low relative to historical levels and the population is fully fished, but there is no indication that overfishing is occurring, and

TACs are selected to ensure a high probability that the spawning biomass will increase to recommended targets.

Status of Wild Stocks Rank:



Criterion 3: Nature and Extent of Bycatch

Bycatch is defined as species that are caught but subsequently discarded (injured or dead) for any reason. Bycatch does not include incidental catch (non-targeted catch) if it is utilized, accounted for and/or managed in some way.

Three types of fishing gear are used to catch sablefish in Canada's Pacific waters: traps, longlines, and bottom trawls. Each type of gear results in different levels of bycatch. Most of the sablefish landings (>70%) are caught using traps, followed next by longlines (~15–25%) and bottom trawls (<10%) (see Figure 1). For the purposes of this report, only bycatch associated with traps and longlines will be evaluated.

Factor 1: Quantity of bycatch

Bycatch in the sablefish fishery is considered to be less than 10% of the retained landings and is therefore considered a low conservation concern. No formal bycatch assessment has been conducted for the fleet. At-sea observer data, although requested by the FOC, had not been made available to the report writer at the time of writing. Fisher logbook data from 2000–2004 indicate that 4.4% of the trap catch was discarded and 11.1% of the longline catch was discarded. The total fisher logbook estimate of discards for both gear types is about 6%. Research surveys using trap gear also collect information on associated catch. The 2001 research survey found that 6.2% of the catch weight was comprised of non-sablefish species, some of which (i.e., rougheye rockfish) would normally be retained in the course of an actual fishery (Wyeth *et al.* 2003).

Factor 2: Population consequences of bycatch

The black-footed albatross, a species listed as endangered by the IUCN, is regularly captured by North Pacific longline fleets (Birdlife International 2004), but catch by the British Columbia sablefish fleet is believed to be minimal. As a condition of license, all sablefish vessels operating in British Columbia require a seabird avoidance device consisting of either single or paired streamers and a towed buoy. The annual take of seabirds by the sablefish fleet is unknown. Albatross species and other seabirds have not been reported in fisher logbook data. Future at-sea and electronic monitoring data will help clarify levels of seabird mortality. Overall seabird bycatch is likely low due to most of the sablefish catch being taken in deepwater with trap gear—a technology that does not easily capture seabirds. The longline fleet likely captures small numbers of seabirds, including the black-footed albatross, but in insignificant quantities (i.e., less than 10 per year). In comparison, Japanese, Taiwanese and US longline fleets operating in the North Pacific capture an estimated 8000 black-footed albatrosses per year (Birdlife International

2005). Overall, it is unlikely that the sablefish fishery is having any population impacts on seabirds or other species captured as bycatch. Overall, this category is considered a low conservation concern.

Factor 3: Trends in bycatch rates

The sablefish fleet became fully integrated with other groundfish fleets in 2006. This integration has likely resulted in fewer discards of certain marketable species (i.e., rockfish species) but the overall discard rate has likely not changed appreciably. Future analysis of comprehensive data maybe used to re-assess the trends in bycatch rates. Since the overall quantity of bycatch is considered a low conservation concern, this factor is *not applicable*.

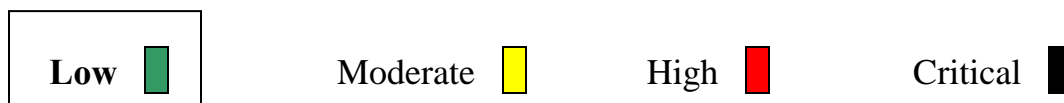
Secondary Factor: Ecosystem impacts

There are no studies indicating ecosystem impacts in response to discards in this fishery. This factor is therefore unknown and receives a rank of moderate.

Synthesis

Overall, the sablefish fishery has a low level of bycatch and is not impacting the populations of non-targeted caught species.

Nature of Bycatch Rank:



Criterion 4: Effect of Fishing Practices on Habitats and Ecosystems

Primary Habitat Factors

Factor 1: Impacts of fishing gear on habitat

Most sablefish caught in British Columbia's waters are taken using bottom traps and longlines, and to a lesser degree with bottom trawls (Figure 1). Traps and longlines are considered to have moderate impacts on bottom habitats and therefore this factor is given a moderate conservation concern (Chuenpagdee *et al.* 2003).

Factor 2: Resilience of the habitat fished

The deepwater sandy habitats preferred by sablefish are considered moderately resilient to fishing gear impacts. This factor is considered a moderate conservation concern.

Factor 3: Spatial extent of the impact

Longlining for sablefish in British Columbia occurs primarily along the continental slope in waters typically between 180 and 1300 m deep (Figure 3). Three quarters of the effort in the sablefish trap fishery takes place between 460 and 825 m (Haist *et al.* 2005). The longline fishery generally occurs at shallower depths, with over three quarters of the fishing effort occurring at less than 460 m. Overall, this fishery is considered as taking place over ‘moderate’ spatial scales and is therefore given a moderate ranking.

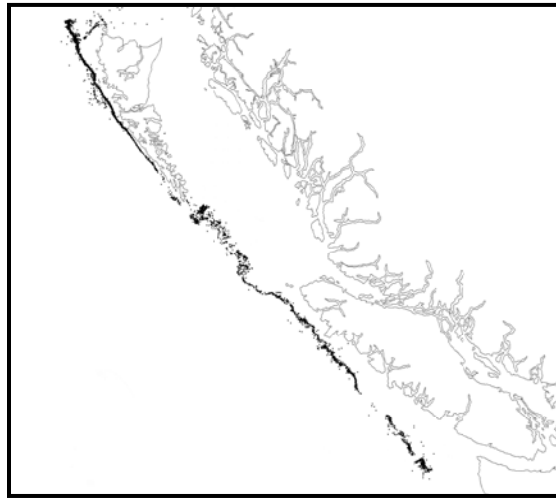


Figure 3. Distribution of directed sablefish fishing (longline and trap) activity in the 2003/2004 fishing year. Figure source: FOC 2005a.

Primary Ecosystem Factors

Factor 1: Disruption of food webs

There are no demonstrated ecosystem impacts caused by the removal of sablefish; therefore, this factor is considered to be unknown.

Factor 2: Changes in ecosystem state

The ecosystem impacts of sablefish traps and longlining have not been demonstrated; therefore, this factor is considered unknown.

Effect of Fishing Practices Rank:

Benign █ Moderate █ Severe █ Critical █

Criterion 5: Effectiveness of the Management Regime

Factor 1: Stock assessments

Sablefish are assessed on a regular basis through a collaborative agreement between Fisheries and Oceans Canada and the Canadian Sablefish Association, which allows for reliable research funding. Stock assessments are thorough and robust with the latest full stock assessment available from the DFO published in 2005. Although the latest full stock assessment is five years old, annual survey data and a management evaluation have been used to adjust the TAC to reflect stock abundance. In January 2011, a paper reviewing management options—including surveys, stock assessment, harvest control rules, and sub-legal size releases—was tabled at the Centre for Science Advice Pacific (CSAP). This paper will be publically available in April 2011. Stock conditions are generally well understood and managed for appropriately. Therefore, this factor is considered a low conservation concern.

Factor 2: Scientific monitoring

Scientific monitoring of sablefish involves both fisheries-independent and fisheries-dependent data. Fisheries-independent data aggregate annual research surveys, tagging, and biological data (FOC 2005). Fisheries-dependent data, the CPUE, are also collected and used as an indicator of stock abundance. Compared with most fisheries in British Columbia and the world, the sablefish fishery receives considerable scientific monitoring and is therefore given a ranking of low conservation concern.

Factor 3: Scientific advice

Scientific advice regarding the recommended yield and TAC is given on an annual basis and is regularly adopted by managers. In 2005, the stock assessment did not give a precise yield recommendation but rather a range of harvest options (0–5500 t). The 2005 yield adopted by managers was 4445 t, allocated between directed sablefish licenses and trawl licenses. Since that time, the TAC has been reduced to 2023 t for the directed sablefish fleet (FOC 2010). Managers consistently use the recommendations provided by scientific advisors. This factor is considered a low conservation concern.

Factor 4: Bycatch

There are no plans in place to reduce bycatch but this factor is *not applicable* because bycatch is considered to be low.

Factor 5: Fishing practices

The fishing practice of longlining is thought to only moderately impact habitat and therefore this category is *not applicable*.

Factor 6: Catch monitoring and enforcement

Fishing regulations are thought to be generally well enforced including 100% dockside monitoring of landings and fisher logbooks, observer coverage, and 100% electronic monitoring (FOC 2010). This factor is considered a low conservation concern.

Factor 7: Management track record

Management has been able to restore and maintain stock productivity through significant changes in management over the last three decades. Although biomass has varied over time and has reached low levels in recent years, management has always responded quickly by lowering the TAC, thereby maintained stock productivity in the long term. This factor is therefore considered a moderate conservation concern.

Table 2. Commercial harvest management measures for the sablefish fishery.

Management Jurisdictions & Agencies	Total Allowable Catch	Size Limit	Gear Restrictions	Trip Limit	Area Closures	Sources
DFO Canadian Sablefish Association	2010/11 2023 t directed, 194 t for trawl	55 cm	Hook and Line Traps Trawl	Not applicable	Most inshore waters are closed to K licenses to protect juvenile rearing areas.	FOC 2010

Synthesis

Management of the British Columbia sablefish fishery conducts regular stock assessments based on robust fisheries-independent and fisheries-dependent data, complies with scientific advice, and employs effective enforcement measures such as observer coverage and electronic monitoring. Management responds quickly to changes in stock productivity. Measures to reduce bycatch and habitat impacts are not considered necessary because bycatch is low and habitat impacts are only a moderate concern. Because the majority of ranked management factors are green and none are red, management is considered highly effective.

Effectiveness of Management Rank:

Highly Effective 	Moderately Effective 	Ineffective 	Critical 
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IV. Overall Evaluation and Seafood Recommendation

Sablefish caught from British Columbia's waters are given an overall ranking of 'Best Choice'. Despite being very long lived (113 years), this species has a low inherent vulnerability to fishing pressure due to its fast growth rates and low age at first maturity. The largest concern in the sablefish fishery at present is the low level of abundance relative to historical highs observed in prior decades. Sablefish abundance is considered primarily driven by large-scale environmental conditions resulting in stronger and weaker year classes that ultimately control the exploitable biomass for the fishery. The sablefish fishery imposes moderate habitat impacts through the use of traps and longlines on moderately resilient bottom types. The bycatch in this fishery amounts to less than 10% of targeted landings and does not regularly include species of special concern; however, future access to comprehensive observer data may change these results. Overall, the management and science supporting this fishery are strong, resulting in an overall seafood recommendation of 'Best Choice'.

Table of Sustainability Ranks

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherent Vulnerability	✓			
Status of Stocks		✓		
Nature of Bycatch	✓			
Habitat Effects		✓		
Management Effectiveness	✓			

Overall Seafood Recommendation:

Best Choice 

Good Alternative 

Avoid 

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Online: <http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/MPLANS/MPlans.htm#Groundfish>
- Fisheries and Oceans Canada. 2010. Pacific region integrated fisheries management plan-sablefish, February 21, 2010 to February 20, 2011. Fisheries and Oceans Canada, Ottawa.
Online: http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/MPLANS/plans10/Groundfish_2010_Jan27.pdf
- Haist, V., A.R. Kronlund and M.R. Wyeth. 2005. Sablefish (*Anoplopoma fimbria*) in British Columbia, Canada: stock assessment update for 2004 and advice to managers for 2005. Canadian Science Advisory Secretariat 2005/031. 182 p.
- Macewicz, B. J., and Hunter, J. R. 1994. Fecundity of sablefish, *Anoplopoma fimbria*, from Oregon coastal waters. *California Cooperative Oceanic Fisheries Investigations Reports* 35: 160-174.
- Mecklenburg, C.W., T.A. Mecklenburg, and L.K. Thorsteinson. 2002. *Fishes of Alaska*. American Fisheries Society.
- Sigler, M.F., C.R. Lunsford, J.T. Fujioka and S.A. Lowe. 2003. Alaska sablefish assessment for 2004. *In* Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska as projected for 2004. Available from North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska 99501-2252.

- Sigler, M.F., Lunsford, C.R., J.T. Fujioka and S.A. Lowe. 2004. Alaska sablefish assessment for 2005. *In* Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska as projected for 2005. Available from Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 7600 Sand Point Way, N.E., Building 4, Seattle, Washington 98115.
- Wyeth, M.R., A.R. Kronlund, and M. Elfert. 2003. Summary of the 2001 British Columbia sablefish (*Anoplopoma fimbria*) research and assessment survey. Canadian Data Report of Fisheries and Aquatic Sciences 1118. 54 p.



Capture Fisheries Evaluation

Species: <u>Sablefish</u>	Region: <u>British Columbia</u>
Analyst: <u>Scott Wallace</u>	Date: <u>March 2011</u>

Seafood Watch™ defines sustainable seafood as originating from sources, whether fished⁴ or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

The following **guiding principles** illustrate the qualities that capture fisheries must possess to be considered sustainable by the Seafood Watch program. Species from sustainable capture fisheries:

- have a low vulnerability to fishing pressure, and hence a low probability of being overfished, because of their inherent life history characteristics;
- have stock structure and abundance sufficient to maintain or enhance long-term fishery productivity;
- are captured using techniques that minimize the catch of unwanted and/or unmarketable species;
- are captured in ways that maintain natural functional relationships among species in the ecosystem, conserves the diversity and productivity of the surrounding ecosystem, and do not result in irreversible ecosystem state changes; and
- have a management regime that implements and enforces all local, national and international laws and utilizes a precautionary approach to ensure the long-term productivity of the resource and integrity of the ecosystem.

Seafood Watch has developed a set of five sustainability **criteria**, corresponding to these guiding principles, to evaluate capture fisheries for the purpose of developing a seafood recommendation for consumers and businesses. These criteria are:

1. Inherent vulnerability to fishing pressure
2. Status of wild stocks
3. Nature and extent of discarded bycatch
4. Effect of fishing practices on habitats and ecosystems
5. Effectiveness of the management regime

Each criterion includes:

- Primary factors to evaluate and rank
- Secondary factors to evaluate and rank
- Evaluation guidelines⁵ to synthesize these factors
- A resulting **rank** for that criterion

⁴ “Fish” is used throughout this document to refer to finfish, shellfish and other wild-caught invertebrates.

⁵ Evaluation Guidelines throughout this document reflect common combinations of primary and secondary factors that result in a given level of conservation concern. Not all possible combinations are shown – other combinations should be matched as closely as possible to the existing guidelines.

Once a rank has been assigned to each criterion, an **overall seafood recommendation** for the species in question is developed based on additional evaluation guidelines. The ranks for each criterion, and the resulting overall seafood recommendation, are summarized in a table.

Criterion ranks and the overall seafood recommendation are color-coded to correspond to the categories of the Seafood Watch pocket guide:

Best Choices/Green: Consumers are strongly encouraged to purchase seafood in this category. The wild-caught species is sustainable as defined by Seafood Watch.

Good Alternatives/Yellow: Consumers are encouraged to purchase seafood in this category, as they are better choices than seafood in the Avoid category. However there are some concerns with how this species is fished and thus it does not demonstrate all of the qualities of a sustainable fishery as defined by Seafood Watch.

Avoid/Red: Consumers are encouraged to avoid seafood in this category, at least for now. Species in this category do not demonstrate enough qualities to be defined as sustainable by Seafood Watch.

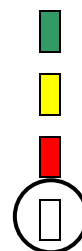
CRITERION 1: INHERENT VULNERABILITY TO FISHING PRESSURE

Guiding Principle: Sustainable wild-caught species have a low vulnerability to fishing pressure, and hence a low probability of being overfished, because of their inherent life history characteristics.

Primary Factors⁶ to evaluate

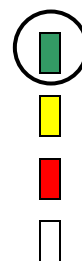
Intrinsic rate of increase ('r')

- High (> 0.16)
- Medium (0.05 - 0.16)
- Low (< 0.05)
- Unavailable/Unknown



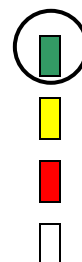
Age at 1st maturity

- Low (< 5 years)
- Medium (5 - 10 years)
- High (> 10 years)
- Unavailable/Unknown



Von Bertalanffy growth coefficient ('k')

- High (> 0.16)
- Medium (0.05 - 0.15)
- Low (< 0.05)
- Unavailable/Unknown



Maximum age

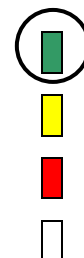
- Low (< 11 years)
- Medium (11 - 30 years)
- High (> 30 years)
- Unavailable/Unknown



⁶ These primary factors and evaluation guidelines follow the recommendations of Musick et al. (2000). Marine, estuarine, and diadromous fish stocks at risk of extinction in North America (exclusive of Pacific salmonids). Fisheries 25:6-30.

Reproductive potential (fecundity)

- High (> 100 inds./year)
- Moderate (10 – 100 inds./year)
- Low (< 10 inds./year)
- Unavailable/Unknown

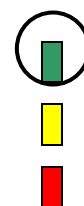
***Secondary Factors to evaluate*****Species range**

- Broad (e.g. species exists in multiple ocean basins, has multiple intermixing stocks or is highly migratory)
- Limited (e.g. species exists in one ocean basin)
- Narrow (e.g. endemism or numerous evolutionary significant units or restricted to one coastline)

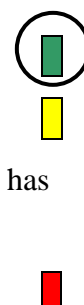


Special Behaviors or Requirements: Existence of special behaviors that increase ease or population consequences of capture (e.g. migratory bottlenecks, spawning aggregations, site fidelity, unusual attraction to gear, sequential hermaphrodites, segregation by sex, etc., OR specific and limited habitat requirements within the species' range).

- No known behaviors or requirements OR behaviors that decrease vulnerability (e.g. widely dispersed during spawning)
- Some (i.e. 1 - 2) behaviors or requirements
- Many (i.e. > 2) behaviors or requirements

**Quality of Habitat: Degradation from non-fishery impacts**

- Habitat is robust
- Habitat has been moderately altered by non-fishery impacts
- Habitat has been substantially compromised from non-fishery impacts and thus has reduced capacity to support this species (e.g. from dams, pollution, or coastal development)



Evaluation Guidelines

1) Primary Factors

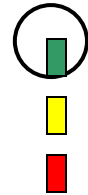
- a) If 'r' is known, use it as the basis for the rank of the Primary Factors.
- b) If 'r' is unknown, then the rank from the remaining Primary Factors (in order of importance, as listed) is the basis for the rank.

2) Secondary Factors

- a) If a majority (2 out of 3) of the Secondary Factors rank as Red, reclassify the species into the next lower rank (i.e. Green becomes Yellow, Yellow becomes Red). No other combination of Secondary Factors can modify the rank from the Primary Factors.
- b) No combination of primary and secondary factors can result in a Critical Conservation Concern for this criterion.

Conservation Concern: Inherent Vulnerability

- Low (Inherently Resilient)
- Moderate (Moderately Vulnerable)
- High (Highly Vulnerable)



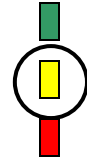
CRITERION 2: STATUS OF WILD STOCKS

Guiding Principle: Sustainable wild-caught species have stock structure and abundance sufficient to maintain or enhance long-term fishery productivity.

Primary Factors to evaluate

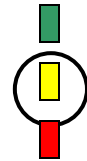
Management classification status

- Underutilized OR close to virgin biomass
- Fully fished OR recovering from overfished OR unknown
- Recruitment or growth overfished, overexploited, depleted or “threatened”



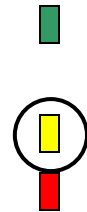
Current population abundance relative to B_{MSY}

- At or above B_{MSY} (> 100%)
- Moderately Below B_{MSY} (50 – 100%) OR unknown
- Substantially below B_{MSY} (< 50%)



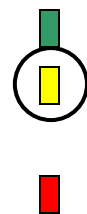
Occurrence of overfishing (current level of fishing mortality relative to overfishing threshold)

- Overfishing not occurring ($F_{curr}/F_{msy} < 1.0$)
- Overfishing is likely/probable OR fishing effort is increasing with poor understanding of stock status OR Unknown
- Overfishing occurring ($F_{curr}/F_{msy} > 1.0$)



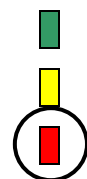
Overall degree of uncertainty in status of stock

- Low (i.e. current stock assessment and other fishery-independent data are robust OR reliable long-term fishery-dependent data available)
- Medium (i.e. only limited, fishery-dependent data on stock status are available)
- High (i.e. little or no current fishery-dependent or independent information on stock status OR models/estimates broadly disputed or otherwise out-of-date)



Long-term trend (relative to species' generation time) in population abundance as measured by either fishery-independent (stock assessment) or fishery-dependent (standardized CPUE) measures

- Trend is up
- Trend is flat or variable (among areas, over time or among methods) OR Unknown
- Trend is down



Short-term trend in population abundance as measured by either fishery-independent (stock assessment) or fishery-dependent (standardized CPUE) measures

- Trend is up
- Trend is flat or variable (among areas, over time or among methods) OR Unknown
- Trend is down



Current age, size or sex distribution of the stock relative to natural condition

- Distribution(s) is(are) functionally normal
- Distribution(s) unknown
- Distribution(s) is(are) skewed



Evaluation Guidelines

A “**Healthy**” Stock:

- 1) Is underutilized (near virgin biomass)
- 2) Has a biomass at or above BMSY AND overfishing is not occurring AND distribution parameters are functionally normal AND stock uncertainty is not high

A “**Moderate**” Stock:

- 1) Has a biomass at 50-100% of BMSY AND overfishing is not occurring
- 2) Is recovering from overfishing AND short-term trend in abundance is up AND overfishing not occurring AND stock uncertainty is low
- 3) Has an Unknown status because the majority of primary factors are unknown.

A “**Poor**” Stock:

- 1) Is fully fished AND trend in abundance is down AND distribution parameters are skewed
- 2) Is overfished, overexploited or depleted AND trends in abundance and CPUE are up.
- 3) Overfishing is occurring AND stock is not currently overfished.

A stock is considered a **Critical Conservation Concern** and the species is ranked “Avoid”, regardless of other criteria, if it is:

- 1) Overfished, overexploited or depleted AND trend in abundance is flat or down
- 2) Overfished AND overfishing is occurring
- 3) Listed as a “threatened species” or similar proxy by national or international bodies

Conservation Concern: Status of Stocks

- Low (Stock Healthy)
- Moderate (Stock Moderate or Unknown)
- High (Stock Poor)
- Stock Critical






CRITERION 3: NATURE AND EXTENT OF DISCARDED BYCATCH⁷




Guiding Principle: A sustainable wild-caught species is captured using techniques that minimize the catch of unwanted and/or unmarketable species.

Primary Factors to evaluate





Quantity of bycatch, including any species of “special concern” (i.e. those identified as “endangered”, “threatened” or “protected” under state, federal or international law)

- Quantity of bycatch is low (< 10% of targeted landings on a per number basis) AND does not regularly include species of special concern 
- Quantity of bycatch is moderate (10 – 100% of targeted landings on a per number basis) AND does not regularly include species of special concern OR Unknown 
- Quantity of bycatch is high (> 100% of targeted landings on a per number basis) OR bycatch regularly includes threatened, endangered or protected species 

Population consequences of bycatch

- Low: Evidence indicates quantity of bycatch has little or no impact on population levels 
- Moderate: Conflicting evidence of population consequences of bycatch OR Unknown 
- Severe: Evidence indicates quantity of bycatch is a contributing factor in driving one or more bycatch species toward extinction OR is a contributing factor in limiting the recovery of a species of “special concern” 

Trend in bycatch interaction rates (adjusting for changes in abundance of bycatch species) as a result of management measures (including fishing seasons, protected areas and gear innovations):

- Trend in bycatch interaction rates is down 
- Trend in bycatch interaction rates is flat OR Unknown 
- Trend in bycatch interaction rates is up 
- Not applicable because quantity of bycatch is low 

⁷ Bycatch is defined as species that are caught but subsequently discarded because they are of undesirable size, sex or species composition. Unobserved fishing mortality associated with fishing gear (e.g. animals passing through nets, breaking free of hooks or lines, ghost fishing, illegal harvest and under or misreporting) is also considered bycatch. Bycatch does not include incidental catch (non-targeted catch) if it is utilized, is accounted for, and is managed in some way.

Secondary Factor to evaluate

Evidence that the ecosystem has been or likely will be substantially altered (relative to natural variability) in response to the continued discard of the bycatch species

- Studies show no evidence of ecosystem impacts
- Conflicting evidence of ecosystem impacts OR Unknown
- Studies show evidence of substantial ecosystem impacts

***Evaluation Guidelines***

Bycatch is “**Minimal**” if:

- 1) Quantity of bycatch is <10% of targeted landings AND bycatch has little or no impact on population levels.

Bycatch is “**Moderate**” if:

- 1) Quantity of bycatch is 10 - 100% of targeted landings
- 2) Bycatch regularly includes species of “special concern” AND bycatch has little or no impact on the bycatch population levels AND the trend in bycatch interaction rates is not up.

Bycatch is “**Severe**” if:

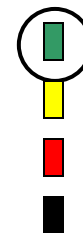
- 1) Quantity of bycatch is > 100% of targeted landings
- 2) Bycatch regularly includes species of “special concern” AND evidence indicates bycatch rate is a contributing factor toward extinction or limiting recovery AND trend in bycatch is down.

Bycatch is considered a **Critical Conservation Concern** and the species is ranked “Avoid”, regardless of other criteria, if:

- 1) Bycatch regularly includes species of special concern AND evidence indicates bycatch rate is a factor contributing to extinction or limiting recovery AND trend in bycatch interaction rates is not down.
- 2) Quantity of bycatch is high AND studies show evidence of substantial ecosystem impacts.

Conservation Concern: Nature and Extent of Discarded Bycatch

- Low (Bycatch Minimal)
- Moderate (Bycatch Moderate)
- High (Bycatch Severe)
- Bycatch Critical



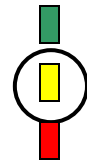
CRITERION 4: EFFECT OF FISHING PRACTICES ON HABITATS AND ECOSYSTEMS

Guiding Principle: Capture of a sustainable wild-caught species maintains natural functional relationships among species in the ecosystem, conserves the diversity and productivity of the surrounding ecosystem, and does not result in irreversible ecosystem state changes.

Primary Habitat Factors to evaluate

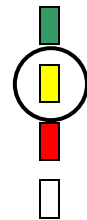
Known (or inferred from other studies) effect of fishing gear on physical and biogenic habitats

- Minimal damage (i.e. pelagic longline, midwater gillnet, midwater trawl, purse seine, hook and line, or spear/harpoon)
- Moderate damage (i.e. bottom gillnet, bottom longline or some pots/ traps)
- Great damage (i.e. bottom trawl or dredge)



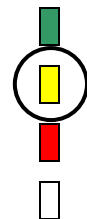
For specific fishery being evaluated, resilience of physical and biogenic habitats to disturbance by fishing method

- High (e.g. shallow water, sandy habitats)
- Moderate (e.g. shallow or deep water mud bottoms, or deep water sandy habitats)
- Low (e.g. shallow or deep water corals, shallow or deep water rocky bottoms)
- Not applicable because gear damage is minimal



If gear impacts are moderate or great, spatial scale of the impact

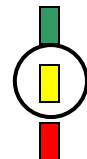
- Small scale (e.g. small, artisanal fishery or sensitive habitats are strongly protected)
- Moderate scale (e.g. modern fishery but of limited geographic scope)
- Large scale (e.g. industrialized fishery over large geographic areas)
- Not applicable because gear damage is minimal



Primary Ecosystem Factors to evaluate

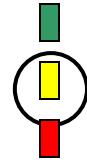
Evidence that the removal of the targeted species or the removal/deployment of baitfish has or will likely substantially disrupt the food web

- The fishery and its ecosystem have been thoroughly studied, and studies show no evidence of substantial ecosystem impacts
- Conflicting evidence of ecosystem impacts OR Unknown
- Ecosystem impacts of targeted species removal demonstrated



Evidence that the fishing method has caused or is likely to cause substantial ecosystem state changes, including alternate stable states

- The fishery and its ecosystem have been thoroughly studied, and studies show no evidence of substantial ecosystem impacts
- Conflicting evidence of ecosystem impacts OR Unknown
- Ecosystem impacts from fishing method demonstrated



Evaluation Guidelines

The effect of fishing practices is “**Benign**” if:

- 1) Damage from gear is minimal AND resilience to disturbance is high AND neither Ecosystem Factor is red.

The effect of fishing practices is “**Moderate**” if:

- 1) Gear effects are moderate AND resilience to disturbance is moderate or high AND neither Ecosystem Factor is red.
- 2) Gear results in great damage AND resilience to disturbance is high OR impacts are small scale AND neither Ecosystem Factor is red.
- 3) Damage from gear is minimal and one Ecosystem factor is red.

The effect of fishing practices is “**Severe**” if:

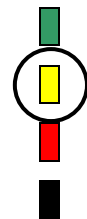
- 1) Gear results in great damage AND the resilience of physical and biogenic habitats to disturbance is moderate or low.
- 2) Both Ecosystem Factors are red.

Habitat effects are considered a **Critical Conservation Concern** and a species receives a recommendation of “**Avoid**”, regardless of other criteria if:

- Four or more of the Habitat and Ecosystem factors rank red.

Conservation Concern: Effect of Fishing Practices on Habitats and Ecosystems

- Low (Fishing Effects Benign)
- Moderate (Fishing Effects Moderate)
- High (Fishing Effects Severe)
- Critical Fishing Effects



CRITERION 5: EFFECTIVENESS OF THE MANAGEMENT REGIME

Guiding Principle: The management regime of a sustainable wild-caught species implements and enforces all local, national and international laws and utilizes a precautionary approach to ensure the long-term productivity of the resource and integrity of the ecosystem.

Primary Factors to evaluate

Stock Status: Management process utilizes an independent scientific stock assessment that seeks knowledge related to the status of the stock

- Stock assessment complete and robust
- Stock assessment is planned or underway but is incomplete OR stock assessment complete but out-of-date or otherwise uncertain
- No stock assessment available now and none is planned in the near future



Scientific Monitoring: Management process involves regular collection and analysis of data with respect to the short and long-term abundance of the stock

- Regular collection and assessment of both fishery-dependent and independent data
- Regular collection of fishery-dependent data only
- No regular collection or analysis of data



Scientific Advice: Management has a well-known track record of consistently setting or exceeding catch quotas beyond those recommended by its scientific advisors and other external scientists:

- No
- Yes
- Not enough information available to evaluate OR not applicable because little or no scientific information is collected







Bycatch: Management implements an effective bycatch reduction plan




- Bycatch plan in place and reaching its conservation goals (deemed effective)
- Bycatch plan in place but effectiveness is not yet demonstrated or is under debate
- No bycatch plan implemented or bycatch plan implemented but not meeting its conservation goals (deemed ineffective)
- Not applicable because bycatch is “low”






Fishing practices: Management addresses the effect of the fishing method(s) on habitats and ecosystems

- Mitigative measures in place and deemed effective 
- Mitigative measures in place but effectiveness is not yet demonstrated or is under debate 
- No mitigative measures in place or measures in place but deemed ineffective 
- Not applicable because fishing method is moderate or benign 

Enforcement: Management and appropriate government bodies enforce fishery regulations

- Regulations regularly enforced by independent bodies, including logbook reports, observer coverage, dockside monitoring and similar measures 
- Regulations enforced by fishing industry or by voluntary/honor system 
- Regulations not regularly and consistently enforced 

Management Track Record: Conservation measures enacted by management have resulted in the long-term maintenance of stock abundance and ecosystem integrity

- Management has maintained stock productivity over time OR has fully recovered the stock from an overfished condition 
- Stock productivity has varied and management has responded quickly OR stock has not varied but management has not been in place long enough to evaluate its effectiveness OR Unknown 
- Measures have not maintained stock productivity OR were implemented only after significant declines and stock has not yet fully recovered 

Evaluation Guidelines

Management is deemed to be “**Highly Effective**” if the majority of management factors are green AND the remaining factors are not red.





Management is deemed to be “**Moderately Effective**” if:

- 1) Management factors “average” to yellow
- 2) Management factors include one or two red factors

Management is deemed to be “**Ineffective**” if three individual management factors are red, including especially those for Stock Status and Bycatch.

Management is considered a **Critical Conservation Concern** and a species receives a recommendation of “**Avoid**”, regardless of other criteria if:

- 1) There is no management in place
- 2) The majority of the management factors rank red.

Conservation Concern: Effectiveness of Management	
➤ Low (Management Highly Effective)	
➤ Moderate (Management Moderately Effective)	
➤ High (Management Ineffective)	
➤ Critical (Management Critically Ineffective)	

Overall Seafood Recommendation

Overall Guiding Principle: Sustainable wild-caught seafood originates from sources that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

Evaluation Guidelines

A species receives a recommendation of “**Best Choice**” if:

- 1) It has three or more green criteria and the remaining criteria are not red.

A species receives a recommendation of “**Good Alternative**” if:

- 1) Criteria “average” to yellow
- 2) There are four green criteria and one red criteria
- 3) Stock Status and Management criteria are both ranked yellow and remaining criteria are not red.

A species receives a recommendation of “**Avoid**” if:

- 1) It has a total of two or more red criteria
- 2) It has one or more Critical Conservation Concerns.

Summary of Criteria Ranks

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherently Vulnerability				
Status of Wild Stocks				
Nature and Extent of Discarded Bycatch				
Habitat and Ecosystem Effects				
Effectiveness of Management				

Overall Seafood Recommendation

Best Choice



Good Alternative



Avoid



